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ABSTRACT

Designed to assist elementary school teachers in stimulating students' interest in noise pollution, this manual provides information which supplements the "Sounds Alive Student Workbook." Suggested for each section of the workbook are discussion questions, experiments, projects and field trips. The guide is intended to provide teachers with maximum flexibility in terms of the time they wish to devote to a unit on noise pollution. (Author/WB)

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# Teacher's Guide for

# A Noise Workbook

SE 034 855

Teacher's Guide
for
Sounds Alive: A Noise Workbook

Prepared

by

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for

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# PRIMARY TEACHER'S GUIDE

## Introduction

Sounds Alive: A Noise Workbook has been developed to assist you in stimulating your students' interest in noise pollution. The workbook is designed to create an awareness of noise as an environmental pollutant, explain the adverse effects of noise, identify major noise sources, describe noise control techniques, and provide ways for students to become involved in working for a quieter environment. The workbook activities present a wide range of opportunities to learn through self-involvement and experimentation.

The purpose of the Teacher's Guide is to provide additional information to help you in your use of Sounds Alive. For each section of the workbook you will find suggested questions to stimulate student involvement and projects or field trips that might be incorporated. The Guide is designed to provide maximum flexibility in terms of the time required to complete the unit on noise pollution. You can control the time involved by the number of ancillary activities that you decide to use.

Several weeks prior to the introduction of the unit, you will undoubtedly want to review your Guide and initiate procedures to arrange for movies, field trips, speakers, equipment, pamphlets, etc. The acquisition of a sound level meter, though not imperative, will enhance the students' interest and involvement in the unit. If your school does not have a sound level meter, there are several sources that you should explore. These include contacting the Environmental Protection Agency (EPA) regional office in your area, your state or local noise control officials, speech and hearing clinics, acoustical firms, and engineering/audiology and acoustical departments at nearby universities. Use the Yellow Pages to assist in your search. If you live in a large metropolitan area, you may be able to locate a rental firm or a sound level meter manufacturer or sales person who would loan the class a meter. Some of the manufacturers are: General Radio, Bruel & Kjaer, Metrosonics, and Quest.

There are several ways you may wish to consider for introducing the unit:

- Quiet on Account of Dinosaur by Jane Thayer is a thought-provoking story that would be an excellent introduction. It was published in 1964 by William Morrow and Company, Inc., 105 Madison Avenue, New York, NY 10016. The price is $5.95.

- The EPA has available a sound/slide show, The George Show, which is a colorful cartoon presentation about the effects of noise on daily life.

- An 8-minute 16mm color film, A Quieter World: It's Up to Us, is also available through EPA. It is a clever mime film that depicts the effects of noise on people.

For your convenience, the names, addresses, and phone numbers of EPA's 10 regional representatives are presented in the Appendix.

Sounds Alive can be adapted for use in K-sixth grades. For pre-readers, several options are available. The teacher can read the materials in "storybook" fashion or, if possible, older students from another class can portray the characters in the story. The exercise of designing an imaginative portrayal of the information for presentation to younger students, parents, or a school assembly provides a mechanism for use of these materials with fifth and sixth graders. It is anticipated that second, third, and fourth graders will enjoy reading Sounds Alive themselves.

## What is Noise?

Teacher's Notes

What Is Noise?

I. Questions:

(1) How would you define noise?

(2) Can you describe a typical day in your life in terms of the sounds and noises you heard?

(3) What is the loudest noise you've heard?

II. Suggested Projects and Field Trips Related to What Is Noise:

(1) After each student has had an opportunity to complete his/her drawings or lists of noise makers, a display could be developed for the hallway bulletin board.

(2) If a cassette tape recorder is available, an outing could be planned for the class to prepare a tape of noise pollution sources in the community, home, or school. The tape could then be shared with another class who would try to identify the noise sources.

Additional Reading Related to What Is Noise:

Noise and You: Scriptographic Booklet
Channing L. Bete Company, Inc.
45 Federal Street
Greenfield, MA 01301
Toll-free No. (800) 628-7723

# The Effects of Noise on People

Teacher's Notes

The Effects of Noise on People

I. Questions:

(1) Can you think of situations in which you have had trouble talking to someone else because of noise interference?

(2) Do you remember times when friends or family have complained of noise interfering with an activity such as relaxing or studying?

(3) Do you think you would be bothered by a lot of noise if you were trying to take a test?

(4) Do your parents or neighbors ever complain about noise in your community? If so, what noises seen to concern them?

(5) Have you or your family ever experienced any of the warning signals about too much noise that Sarah Screech describes?

II. Classroom Experiments and Projects Related to the Effects of Noise on People:

(1) Have the students prepare a skit about the effects of noise. Perhaps the skit could be performed for parents, other classes, or the school assembly.

# How Sound is Measured

Teacher's Notes

How Sound Is Measured

I. Questions:

(1) Can you describe how sound is measured?

(2) Does anyone know what a decibel (dB) is?

(3) If one sound is 40 dB and another is 60 dB, which sound is louder?

(4) How loud does a sound have to be before it interferes with hearing speech?

II. Suggested Projects, Field Trips, and Experiments Related to How Sound Is Measured:

(1) If a sound level meter is available, you and the students could undertake surveys of noise in and around the school area. The students should understand that the sound level meter is a sensitive instrument that should be handled carefully and not dropped. Listed below are some ideas for surveys.

(a) School Noise Survey: Take measurements in areas such as the classroom, lunchroom, hallway, playground, and auditorium. Chart the measurements and discuss factors that affect the noise levels.

(b) Transportation Noise Survey: If there is a roadway nearby, the students could use the sound level meter to compare noise from passing cars, motorcycles, trucks, and buses.

(2) The students could design a big display (such as a noise thermometer) showing the sound levels of the various measurements they have made.

(3) The most effective way to create an understanding of the adverse effects of excessive noise is to personally experience the situation. If there is a printing company, a mill, or some other noisy industry in your community, arrange a site visit. The students will benefit from learning about the

particular industry, while experiencing the noise levels associated with the process. Encourage them to try to communicate while in the noisy environment. It would also be useful to arrange for them to try ear protectors to see how the noise levels are reduced. If possible, hearing tests for some of the students, both before and immediately after the plant tour, would demonstrate the adverse effects of noise on the hearing mechanism. Arrangements for the hearing tests might be made through the school health program or a university, community, or hospital speech and hearing clinic. Check the Yellow Pages of your telephone directory for a listing of area speech and hearing clinics.

(4) The game Noise Nopoly, featured in the workbook, would be a fun project during this period. The students might want to create their own Noise Nopoly squares based on the measurements they have made.

# How We Hear

Teacher's Notes

How We Hear

I. Questions:

(1) Have you had a hearing test?

(2) Can you describe the ear?

(3) Do you know how sound travels to the brain?

II. Suggested Projects, Field Trips, and Experiments:

(1) Arrange with the school nurse for the children to have hearing screenings and consider presenting this unit prior to the hearing tests. If school hearing screenings are not possible, the children might visit a local speech and hearing clinic. These clinical facilities are listed in the Yellow Pages.

(2) Make plans to have an audiologist from a speech and hearing clinic visit the children's class to discuss hearing testing and hearing problems.

(3) To demonstrate the appearance of a sound wave and how sound travels, attach the end of a felt tip marker to a tuning fork. Place a long piece of paper on a flat surface such as a table or floor. Strike the tuning fork with a hammer and as soon as it starts to vibrate, place the attached felt tip on the paper. Have a second student move the paper slowly until the vibrations stop. Have the students examine the tracing to identify a wave-length and the properties related to frequency and intensity.

(4) To explore sound as a form of energy, we must first define energy. If we accept the definition of energy as the ability to do work, we then need to define the term work. For this experiment, let us assume that work is done on a body when something causes it to move. Now, let's determine if sound is a form of energy. For this experiment, you will need a tuning fork, a tennis ball attached to a string, and a bowl of water.

First, hang the tennis ball close to the tuning fork and strike the tuning fork while observing the tennis ball. Note what happens to the tennis ball and see if you can determine why this happened. Now, strike the tuning fork again and place the vibrating fork in a bowl of water. After observing what happens to the water, see if you can explain what transpired.

(5) This experiment is designed to demonstrate some of the ways in which sound travels. Students should work in pairs or groups.

(a) To determine if sound travels through air, hold two stones in the air and hit them together to see if you can hear the sound produced.

(b) To determine if sound can travel through a vacuum, obtain an electric buzzer, a jar, and an air pump from the science lab. Suspend the buzzer in the jar and use the air pump to remove all the air in the jar. Then, turn on the buzzer to see if you can hear it. If you can't, turn the pump off and allow air to enter the jar while listening for the buzzer. From this experiment, do you think sound can travel in a vacuum? What is the reason for your conclusion?

# Hearing Problems

Teacher's Notes

Hearing Problems

I. Questions:

(1) Do you know some of the causes of hearing loss?

(2) Have you ever had your ears checked by an otologist?

(3) Do you know anyone who has a hearing loss? Have you ever talked to them about the problems caused by not hearing well?

(4) Can you imagine how difficult it would be to learn to speak if you could not hear?

II. Suggested Projects, Field Trips, and Experiments Related to Hearing Problems:

(1) To explore the effects of noise on communication, perform the following experiment. To complete this experiment, you will need a sound level meter, a yardstick, tape, and a radio. If the scale on your sound level meter begins at 30 or 40 dB, you will need to be certain that your measurements are on the scale. If you do not have a sound level meter, you can still complete the experiment without making precise measurements.

(a) Assign one person to be the speaker. The speaker is to stand in the same place throughout the experiment. Mark the speaker's position with a piece of tape and place the radio next to the speaker.

(b) Assign another person to be the listener. This person should stand at the opposite end of the room.

(c) Turn the radio on and set at a low volume. Measure the level.

(d) Have the speaker begin repeating a sentence while the listener moves forward until he/she can hear and can repeat the sentence. Measure the distance between speaker and listener.

(e) Using different sentences, or different listeners, repeat the experiment several times, each time increasing the volume by 10 dB and measuring the resultant distance between speaker and listener.

(f) Chart what happens as the radio volume increases. Don't changes occur in the behavior of both the speaker and the listener?

(2) Although physicians are very busy, you might be able to arrange for one to come to discuss hearing problems with the children. If not, you might consider inviting the school nurse.

# The National Noise Problem

Teacher's Notes

The National Noise Problem

I. Questions:

(1) Why has noise pollution become an increasing problem in our country?

(2) What sources contribute to our noisy world?

(3) How will noise labels on products assist us?

(4) Can you describe some ways the Federal government is trying to control noise?

II. Suggested Field Trips, Projects, and Experiments Related to Noise Control:

(1) Prepare an article for the school newspaper to educate fellow students about noise pollution.

(2) Develop a program for a "Quiet Day" at school. Activities could include a poster contest and hearing screening tests arranged through the school health department or through a university or community speech and hearing center.

(3) The students could design a questionnaire about noise, exploring individual reaction to noise, knowledge about ways to control noise, etc. Through interviewing community residents, the students can obtain information and also give information about what they have learned about noise pollution. The results of the survey could then be condensed into a report about noise in your community. The students might wish to consider transmitting their findings to the local government or writing a letter to the editor of the local paper. The students should now be ready to work the crossword puzzle in the back of the workbook and play the matching card game.

# Ways to Control Noise

Teacher's Notes

Ways to Control Noise

I. Questions:

(1) Does anyone know if our community or state has a noise control ordinance?

(2) What are some noise control approaches you and your family could take at home?

(3) What could we do here at school to reduce the noise levels?

(4) What could our community do?

(5) What are noisy industries doing to reduce work-place noise?

II. Suggested Field Trips, Projects, and Experiments Related to Ways to Control Noise:

(1) Identify the major sources of noise within your school and develop a school noise control ordinance to help control these problems.

(2) Design a leaflet with helpful hints about ways individuals can control noise for students and/or parents.

(3) The students could investigate the relationship between noise pollution and other environmental pollutants. The goal should be to integrate common threads of environmental concern. For example, motor vehicles are a major source of air pollution, noise pollution, and energy consumption. Also, many controls implemented to conserve energy in the home are also effective noise reducers.

(4) If your state or local government has a noise control ordinance, you might arrange for the students to visit, or to have a speaker from, the noise program. Inasmuch as noise program staffs are typically quite small, allow adequate time for the arrangements.

(5) Each year more local governments are implementing noise control ordinances. If your local community council currently has legislation under consideration, the students would benefit greatly from observation of the deliberations. It is an interesting experience to become aware of the multitude of considerations, ranging from political priorities, through budgetary and personnel concerns. If public hearings are held, the students will be provided an opportunity to see how an individual can attempt to affect change in governmental processes.

(6) To understand ways through which noise is controlled or reduced, complete the following experiments. You will need a coffee can, shoe box, cigar box, jewelry box, marbles, and a small piece of foam rubber.

(a) Place several marbles in each of the three larger containers. Cover the containers and shake each one to rank them in terms of the noise produced.

(b) Now, place the foam rubber around the marbles and return them to one of the containers. Observe the difference in the sound.

(c) Next, place the marbles in the smaller jewelry box, tape the box shut, and place the box into one of the larger containers. Shake and note the noise level produced.

(d) If the language laboratory has headsets, or if one of the students has a headset at home, repeat parts of the above experiments while wearing the headset to obtain an idea of how ear protectors reduce noise levels for workers.

(e) Following the completion of these experiments, discuss other possible approaches to controlling noise that you have covered in the text. Consider the advantages and disadvantages of the various approaches.

# Summary

## SUMMARY

Thank you for introducing this unit on sound and noise to your students. We would appreciate your completing the opinionnaire to assist us in revising the unit to meet the needs of educators. The recognition by youngsters of the adverse effects of too much noise is a critical factor in controlling growing environmental noise levels. Your assistance is appreciated. Thank you.

If you would like to receive more information about noise, its effects, and what steps you can take to reduce it, write to:

U.S. Environmental Protection Agency
Office of Noise Abatement and Control
Washington, DC 20460

# Appendix
## U.S. Environmental Protection Agency
## Regional Noise Program Chiefs

# EPA REGIONAL NOISE PROGRAM CHIEFS

I. Mr. Al Hicks
EPA - Region I
JFK Federal Building, Room 2113
Boston, MA 02203
Phone: (617) 223-5708
FTS: 8/ 223-5708

II. Dr. Donald A. Deieso
EPA - Region II
26 Federal Plaza
New York, NY 10007
Phone: (212) 264-2110
FTS: 8/ 264-2110

III. Mr. Patrick Anderson
EPA - Region III
Curtis Building
6th & Walnut Streets
Philadelphia, PA 19106
Phone: (215) 597-9118
FTS: 8/ 597-9118

IV. Mr. James Orban
EPA - Region IV
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Atlanta, GA 30308
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FTS: 8/ 257-4861

V. Mr. Horst Witschonke
EPA - Region V
P.O. Box 2451
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VI. Mr. Mike Mendias
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First International Building
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Dallas, TX 75270
Phone: (214) 767-2734
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